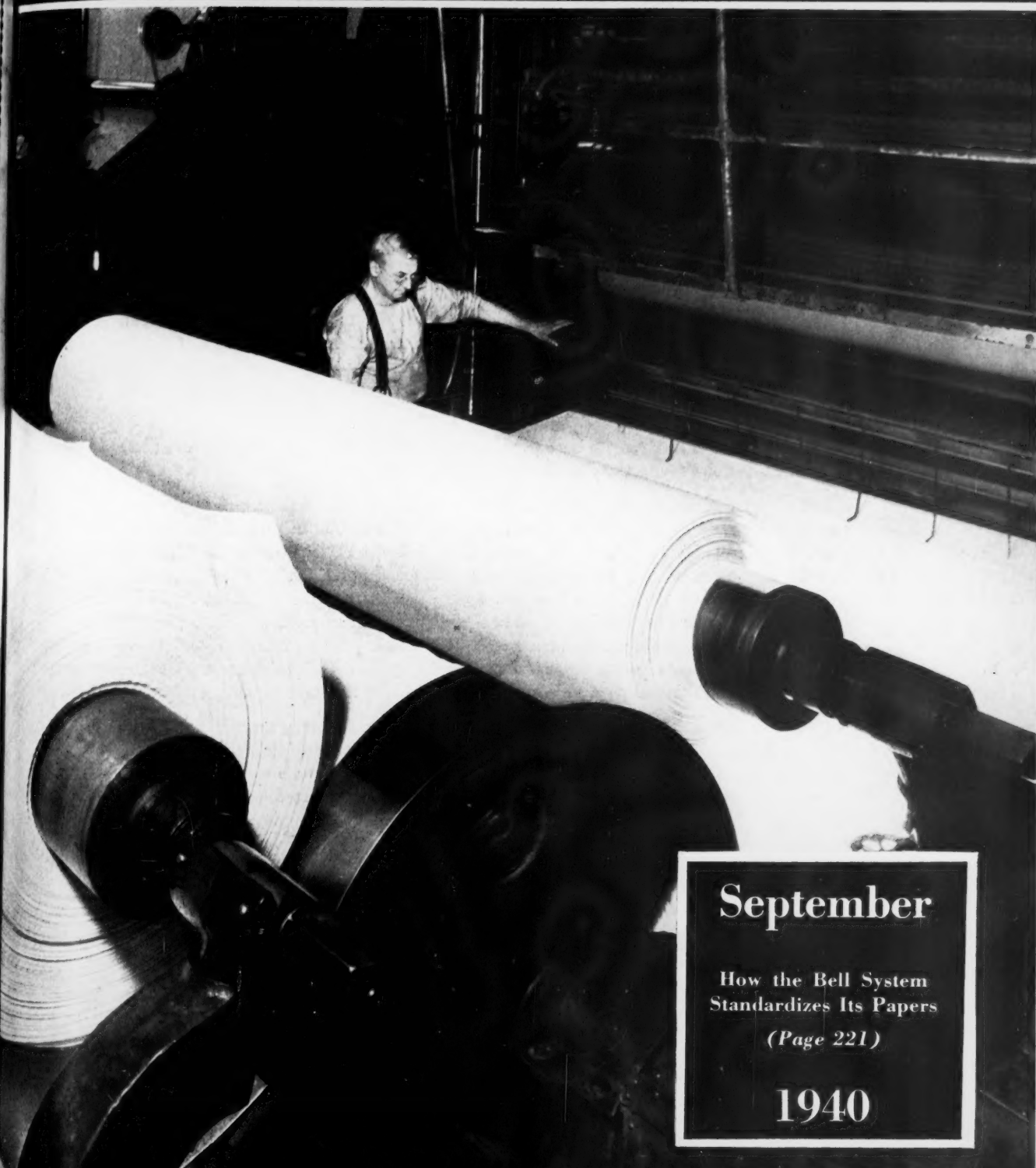


Industrial Standardization

and Commercial Standards Monthly



September

How the Bell System
Standardizes Its Papers
(Page 221)

1940

Standardization Moves On

COMMENTING on new type insulation allowed by the 1940 National Electrical Code recently approved as an American Standard, *Business Week* calls attention to the fact that new type wiring of a given size will have twice the capacity of the old wiring, with equal safety. This means that office buildings and apartment houses will be able to increase their electrical loads materially without putting in more circuits.

In terms of money, the newly revised code means considerable savings in cost of rewiring. A particular job which was going to cost \$407.69 under the old provisions, will now cost \$184.36. New rubber and synthetic compounds for insulation are recognized in this 1940 revision of the code. A new wiring method which utilizes the hollow spaces of cellular steel floor construction for raceways is also recognized.

Thus standardization moves on, making use of new processes and new materials.

Standardization is undertaken for economy! For convenience! For safety! A Pittsburgh department store developed a standard salescheck now used by two stores and being considered by two others. Savings resulting from this job have already exceeded \$5,000. In another store standardization of wrapping supplies and revised workplace layout led to savings of \$1,500.

Standards for ladders, for safe practices in window cleaning, and for prevention of dust explosions save money in another way, by saving lives.

Everyone knows the story of standardization and the automobile. How you can purchase a new piston pin milled to an accuracy of $3/10,000$ of an inch (one-tenth the thickness of a human hair) for less than a dollar. Yet it was not so long ago that the first car was completely assembled out of stock parts, marking the beginning of mass production methods in this industry. A good machine might be made by hand today without benefit of standardized parts at a cost of something like \$10,000 per car. How many people could afford a car at that price? Standardization has brought the car down to our price range. It has given us interchangeable electric light sockets, safe elevators, a uniform system of colors in traffic signals, etc.

The American Standards Association provides the machinery through which the various industrial groups of the country have been coming together for years to establish American industrial standards and safety codes. To date some 400 of these standards have been approved through the cooperation of more than 600 industrial groups.

Through constant revision these standards move forward with the changes in the industries.

AMERICAN STANDARDS ASSOCIATION

Officers

Edmund A. Prentis, President
P. G. Agnew, Secretary

R. E. Zimmerman, Vice-President
Cyril Ainsworth, Assistant Secretary

Board of Directors

R. P. Anderson, secretary, Division of Refining, American Petroleum Institute, New York—Chairman, ASA Standards Council

Dana D. Barnum, Boston, Mass., Past-President, American Standards Association

Carl Breer, executive engineer, Chrysler Corporation, Detroit, Michigan—Automobile Manufacturers Association

Lyman J. Briggs, director, National Bureau of Standards, Washington, D. C.—U. S. Department of Commerce

G. S. Case, chairman of Board, Lamson and Sessions Company, Cleveland, Ohio—American Society of Mechanical Engineers

H. P. Charlesworth, assistant chief engineer, American Telephone & Telegraph Company, New York—ASA Telephone Group

C. L. Collens, president, Reliance Electric & Engineering Company, Cleveland, Ohio—National Electrical Manufacturers Association

Howard Coonley, chairman of Board, Walworth Company, New York—Manufacturers Standardization Society of the Valve & Fittings Industry

Wallace Falvey, vice-president, Massachusetts Bonding & Insurance Company, New York—National Conservation Bureau

F. M. Farmer, vice-president, Electrical Testing Laboratories, New York—Past-Chairman, ASA Standards Council

Wm. F. Groene, vice-president, R. K. LeBlond Machine Tool Company, Cincinnati, Ohio—National Machine Tool Builders' Assn.

John C. Parker, vice-president, Consolidated Edison Co. of New York, New York—ASA Electric Light & Power Group

J. Edgar Pew, vice-president, Sun Oil Company, Philadelphia—American Petroleum Institute

Haraden Pratt, vice-president and chief engineer, Mackay Radio and Telegraph Company, New York—Institute of Radio Engineers

Edmund A. Prentis, Spencer, White & Prentis, Inc., New York—President, American Standards Association

G. J. Ray, vice-president, Delaware, Lackawanna & Western Railroad Co., New York—Association of American Railroads

A. R. Small, president, Underwriters' Laboratories, Chicago, Illinois—ASA Fire Protection Group

Jerome Strauss, vice-president, Vanadium Corporation of America, New York—American Society for Testing Materials

R. E. Zimmerman, vice-president, U. S. Steel Corporation, New York—American Iron and Steel Institute

Standards Council

R. P. Anderson, secretary of the Division of Refining, American Petroleum Institute, New York, Chairman

H. S. Osborne, operating results engineer, American Telephone & Telegraph Company, New York, Vice-Chairman

Chairmen of Correlating Committees

Building—Rudolph P. Miller, Consulting Engineer, New York

Highway Traffic—A. M. Wolf, Consulting Engineer, New York

Consumer—Max Gertz, B. Gertz, Inc., Jamaica, N. Y.

Mechanical—Alfred Iddles, Babcock & Wilcox Co., New York

Electrical—C. R. Harte, Connecticut Company, New Haven, Conn.

Mining—Dan Harrington, chief, Health & Safety Branch, U. S. Bureau of Mines

Safety—Walter S. Paine, Aetna Casualty & Surety Co., Hartford, Conn.

ASA Member-Bodies

Am. Gas Association
Am. Home Economics Assn.
Am. Institute of Bolt, Nut & Rivet Mfrs.

Am. Institute of Elec. Engineers
Am. Iron & Steel Institute
Am. Petroleum Institute

Am. Soc. of Civil Engineers
Am. Soc. of Mechanical Engineers
Am. Soc. for Testing Materials

Am. Soc. of Tool Engineers
Am. Transit Association
Am. Water Works Association

Assn. of American Railroads
Automobile Mfrs. Assn.
Cast Iron Pipe Research Assn.

Copper & Brass Research Assn.
Electric Light and Power Group:
Assn. of Edison Illuminating Companies

Edison Electric Institute
Federal Housing Administration
Federal Works Agency

Fire Protection Group:
Associated Factory Mutual Fire Insurance Companies

Nat. Bd. of Fire Underwriters
Nat. Fire Protection Assn.
Underwriters' Laboratories, Inc.

Institute of Radio Engineers
Mfrs. Standardization Soc. of the Valve and Fittings Industry
Nat. Assn. of Mutual Casualty Companies

Nat. Conservation Bureau
Nat. Electrical Mfrs. Assn.
Nat. Machine Tool Builders' Assn.

Nat. Retail Dry Goods Assn.
Nat. Safety Council
Outdoor Advertising Assn. of America, Inc.

Photographic Manufacturers Group:
Agfa Ansco Division of General Aniline & Film Corporation

Eastman Kodak Company
Soc. of Automotive Engineers
Telephone Group:

Bell Telephone System
U. S. Department of Agriculture

U. S. Department of Commerce
U. S. Department of the Interior

U. S. Department of Labor
U. S. Govt. Printing Office

U. S. Navy Department
U. S. Treasury Department
U. S. War Department

Associate Members

Am. Association of Textile Chemists and Colorists

Am. Automobile Association
Am. Council of Commercial Labs.
Am. Gear Mfrs. Association
Am. Hospital Association
Am. Institute of Architects

Am. Soc. of Heating & Ventilating Engineers
Am. Soc. of Refrigerating Engrs.

Am. Trucking Assns., Inc.
Am. Welding Society
Anti-Friction Bearing Manufacturers Association, Inc.

Assn. of Iron & Steel Engrs.
Associated General Contractors of America

Brick Manufacturers Association of New York

Grinding Wheel Mfrs. Association
Gypsum Association

Heat Exchange Institute
Illum. Engineering Society

Industrial Safety Equipment Assn.
Insulation Board Institute

Internat. Acetylene Association
Modular Service Association

Nat. Elevator Manufacturing Industry, Inc.

Radio Mfrs. Association
Society of Motion Picture Engineers

Structural Clay Products Institute

Company Members—Some 2,000 industrial concerns hold membership either directly or by group arrangement through their respective trade associations.

Industrial Standardization

Combined with Commercial Standards Monthly

Published Monthly by
American Standards Association
29 West 39th Street, New York
with the cooperation of the National Bureau of Standards

RUTH E. MASON, *Editor*

This Issue

Our Front Cover: The final stage in paper-making: winding the finished paper on reels.
Photo courtesy Bell Telephone System.

How the Bell Telephone System Standardized Its Business Papers. By James J. Murphy	221
Man's Love of Round Numbers. By P. G. Agnew	230
The 1940 National Electrical Code. By Alvah Small	234
ASTM Submits Revisions for American Standards	237
Committee on Concrete Recommends Standards and Good Practice	238
ASA Approves Gas-Appliance Requirements. By Milton Zare	239
Standardization in the Steel Industry. By R. E. Zimmerman	242
British Association Continues Work on Standards for Consumer Goods	244
Australian Standards Association Adopts British Steel Standards	245
ASA Standards Activities	247
Underwriters' Laboratories Issue Requirements	228
Spray Residue Tolerances for Apples and Pears	229
Revision Clarifies Grades of Ash Handles	229
Revised Recommendation for Coated Abrasive Products	229
Revised Commercial Standard for Douglas Fir Ply-wood	236
Consumer Adviser Is Asked to Study Standards	236
New Australian, Canadian, and British Standards	236
Foreign Draft Standards Received by ASA	237
Corrosion Coordinating Committee Names Spelier Chairman	238
Underwriters' Laboratories Issue Standard for Wire	238
ASTM Honors C. M. Chapman	241
ASA Pamphlet Tells How Committees Develop Standards	241
New York Code Requires Standard Soil Pipe	241
Federal Specifications Approved and Available	241
BSI Tells South America About British Standards	244
List of Standards Received from Australia	244
Standard Plant Names Urged to Make Trade Easier	245
British Standards Institution Changes Methods	246
Standards for Wrapping and Packing Supplies	246
New Method for Measuring Water Absorption of Plastics	246
Recommendation for Abrasive Grain Sizes Reaffirmed	246



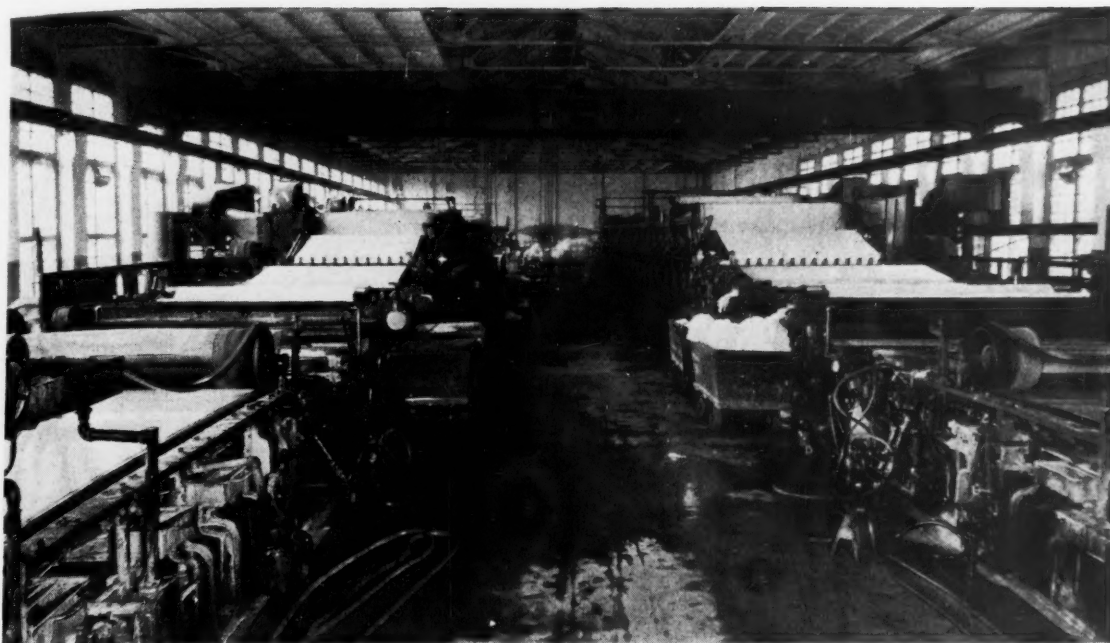
Reg. in U. S. Pat. Off.

**Standardization is dynamic, not static. It means
not to stand still, but to move forward together.**

Subscription price \$4.00 per year U. S. and
Canada (foreign \$5.00); Special to schools
and libraries \$2.00 (foreign \$3.00);
single copies 35 cents

September, 1940

Vol. 11, No. 9



Paper starts as a thin solution of pulp and water at the "wet" end of these Fourdrinier machines, in the foreground, is screened, pressed, and ironed on the way, and reaches the distant end as a finished product

How the Bell Telephone System Standardized Its Business Papers¹

Standard range of grades reduces cost of business papers, assures use of grades best suited to the purpose, and saves time through orderly standard procedure, Bell System finds

by James J. Murphy

STANDARDIZATION and centralized supply arrangements have been applied [in the Bell System] not only to directories but also to other items of supply which, while less familiar, are nevertheless important in the conduct of the business. Business papers are notable examples.

These are the papers used for records, reports, correspondence, bills, orders, instructions, specifications, checks, and the many other purposes for which papers serve as the medium for business transactions. While effort is constantly di-

rected toward reducing paper work to the minimum consistent with orderly operation, Bell System requirements for this class of papers amount to over 5,000,000 pounds annually—equivalent to more than five hundred million letter-size sheets.

So vast a quantity of papers presents many problems in selecting those best suited to tele-

¹Reprinted from the Bell Telephone Quarterly, April, 1940.

phone company needs from the great variety commercially available; in adapting those selected to the numerous particular purposes for which papers of this kind are used; and in establishing the most advantageous supply arrangements.

The first attempts to meet these problems were begun in 1917. The Western Electric Company, in performing its function of establishing centralized supply arrangements whenever these could be carried out to the best interest of the service, had entered into contracts to centralize the purchasing of the bulk of printed business papers for two of the Associated Companies. While this procedure offered some measure of economy over the general practice of dealing with a number of supply sources and of handling each printed form as an individual transaction, it left much to be desired. The forms required were listed under these early contracts and individually priced according to the judgment of each contractor submitting a bid. The one whose total

bid was lowest received the business, although for any particular form his price might be higher than other bidders.

Numerous Brands Specified

In all of these negotiations, paper was a constant source of difficulty. Numerous brands were specified, many of which the printer did not normally carry in stock, and the question of substitution would necessarily arise. Inasmuch as there were hundreds of forms, on papers of many different sizes, weights, and colors, substitution only led to confusion and to the question of whether the substitutions offered by one bidder were the equal in quality of the substitutions offered by another. This difficulty was magnified by the fact that little definite data as to paper quality were generally available.

A further complication developed in the rapid increases in paper prices during the war period. The printer could not control the cost of paper to nearly the same extent to which he could control the cost of his printing and binding, which were under his own supervision. As paper prices went up, the cost of the finished product went up also; and in order to save the contractor from serious losses, price increases were granted which might or might not have been less than a competitor would have asked. The contracts, accordingly, lost much of their advantage.

It was evident that development of a new procedure was necessary. The objective would be to establish a range of standard papers of suitable quality for all requirements. These would then be supplied to the printer at definite prices, in order to relieve him of the burden of the paper problem as to both purchasing and quality. Under this plan, the printers, in submitting their bids for a telephone company's business paper requirements, would be concerned only with those elements of cost over which they exercised control.

Information on Quality Meager

The American Telephone and Telegraph Company was asked to undertake this work, along with its other standardization activities.

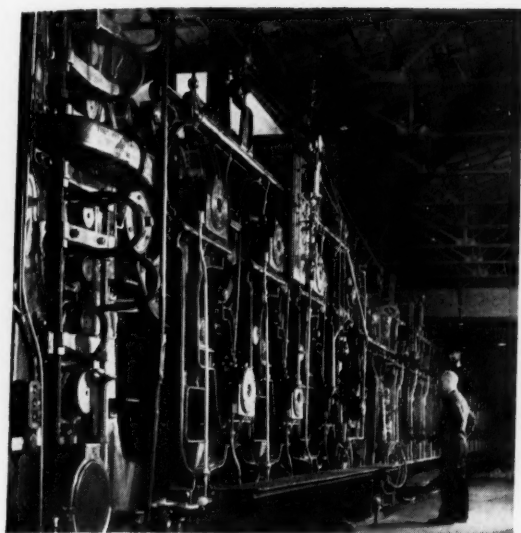
At the time the AT and T Company undertook standardization, information for consumer judgment of quality in business papers was indeed meager. Papers were generally sold on a brand basis. Specifications accurately defining strength, wearing qualities, and other characteristics of the types of papers used for business purposes were little used as a basis of purchase.

Testing by consumers was infrequent and, if they wished to make tests, few instruments were to be had. The usual complement of physical



Some Typical Business Papers

These and hundreds of others are printed on stocks and to specifications described in this article



The "dry" end of a Fourdrinier machine



The final step: winding the finished paper on reels

testing equipment consisted of the Mullen or "pop" tester, for measuring the bursting strength of paper by breaking a hole through a sheet, a weighing scale, and a micrometer. Buyers would do some "practical" testing by tearing a sheet of paper in several directions, by feeling and rattling it, and even by chewing a small piece. What the last disclosed has not been passed on to us. Experience was the principal guide, and one not infrequently upset when a manufacturer elected to change the quality of a particular brand during the course of time or even to discontinue it.

The AT and T engineers decided to establish a range of standard papers adequate for telephone needs, according to basic types. They found that an adequate range was available among the regular commercial grades and concluded that, despite volume sufficient to justify manufacture of special grades, this procedure should be avoided. To ensure that they were fully informed regarding all available grades, they visited paper mills manufacturing qualities varying from the poorest to the best.

Paper manufacturing processes are generally similar and, in so far as broad principles are concerned, relatively simple. Paper is basically cellulose fibre, obtained principally from wood and from cotton rags. The wood or rags are reduced to pulp to which a small amount of sizing material is added, consisting of rosin, glue, or starch to serve as a binder. Proportions of clay and other fillers are added also to improve opacity and finish. Spruce and pine are the lowest-cost sources of cellulose and are, accordingly, the principal raw material.

For ground wood pulp, which is the major component of newsprint and of many stationers' papers, the wood is debarked, knots are removed, and it is then ground against a stone in the presence of water, to shred the fibres apart. This method of pulp manufacture is the least expensive, but it is also rather drastic and the pulp is weaker and less permanent than that produced by chemical processing, which is employed for the better grades.

The chemical processes consist of reducing the wood to chips and boiling these for a number of hours with either an acid or alkaline solution, depending upon the characteristics desired in the pulp—to free the fibres by cooking out the resins binding them together. Chemical pulps are bleached to obtain a better white. Bleaching reduces fibre strength to some degree but it also imparts greater permanence by producing a purer cellulose.

When rags are used as raw material, they are cut into small pieces, cooked with alkali and then bleached.

After the pulp is conditioned, it is mixed with great quantities of water and then flows as a thin solution onto the traveling screen of a huge paper-making machine which dries, presses, and irons the pulp before it is transferred to a roll as finished paper.

Pulps Have Different Quality

An important and interesting phase of paper making, from the standpoint of paper standardization, is the compounding of pulps to produce

papers of various characteristics. Each pulp has qualities that are reflected in the strength, permanence, opacity, etc., of the finished product.

Ground wood or mechanical pulp, as it is also called, is low in cost, has high opacity, limited strength, and limited permanence—qualities which make it suitable for newsprint and for many business purposes when the usage is large and paper of low strength and permanence is satisfactory. A great quantity of paper composed principally of ground wood is used in the Bell System for tickets to record telephone calls, the consumption exceeding a million and a quarter pounds annually.

Three Classes of Pulps

Chemical pulps are of three classes: sulphite, sulphate, and soda, the latter manufactured from deciduous woods such as poplar and birch. Papers made from sulphite pulp comprise the great majority of business stationery. It produces a paper of good appearance and wearing qualities at moderate cost. Sulphate pulp makes our brown wrapping paper. It is a stronger fibre than sulphite and is moderate in cost, but because of the brown color its use for business papers is largely confined to envelopes and file folders. Soda pulp is employed only in combination with others. It has little strength but is opaque and finds use where papers having bulk and opacity are required. It is commonly found in combination with sulphite pulp in envelope stocks.

Rag pulp produces papers of the highest grade. They have the greatest strength and resistance to erasure, but are also the most costly. Rag papers are employed for permanent records, ledgers, and other purposes requiring maximum durability and appearance.

The usual combinations of pulps are: ground wood and sulphite; ground wood, sulphite, and soda; sulphite and soda; sulphite and rag. The finished paper bears the characteristic of the pulps of which it is composed in ratio to the proportions used.

Papers Analyzed and Tested

Upon completion by the AT and T engineers of their review of the manufacturing and technical aspects of the standardization job, the papers in use by the Associated Companies were analyzed for pulp composition, and were tested for strength and other physical characteristics in so far as the limited equipment available at that time permitted. The result of all this work was a thorough acquaintance with both the technology of the available grades of business papers and with

the kinds of papers required by the telephone companies.

Combining the technical information, on the one hand, with the usage requirements, on the other, made possible the establishment of a standard range of papers for the Bell System. Originally 13 grades were set up. They ranged from a low-cost paper, composed of ground wood and sulphite pulps, for temporary use forms, to 100 per cent rag papers for permanent record purposes. This list has been revised and expanded during the past 20 years, in pace with the changing requirements of the telephone companies and with the technical developments in papers, until today there are 23 standard grades. The chart on page 226 lists 19 of the most widely used standards.

When the original 13 grades were selected, specifications in the form of standard samples were established for each grade. At the time, the standard sample was the nearest approach that could be made to definite specifications, and while data on composition and physical characteristics were developed, it was most practical to buy by sample.

Humidity Controls Strength

Several conditions contributed to this situation. Raw material and manufacturing control was such that paper made on one day was not necessarily equal in all respects to paper made on the day following, so that considerable tolerance in quality had to be allowed. Paper strength, particularly with respect to tearing and folding, is subject to wide fluctuation with changes of humidity, and a paper that might pass specification requirements on a humid day in summer might fail badly on a cold day in winter when the relative humidity in the laboratory was very low. Air-conditioned laboratories were extremely few at that



Paper-Testing Machines

time, and very expensive. Specifications are normally established on the basis of minimum requirements, but to set them sufficiently low to cover the worst conditions would have resulted in an inadequate definition of grades. The sample basis was accordingly decided on.

Testing Instruments Used Now

Many instruments for the testing of papers have since come into wide use by the paper industry and by independent laboratories, and testing laboratories are conditioned to a definite temperature and humidity. The instruments include devices for measuring opacity, brightness, light reflection, tearing, folding and tensile strengths, smoothness, stiffness, acidity, and degree of permanence. A group of these instruments is shown on the opposite page.

Substantial advances have likewise been made in the technology of paper manufacture and in the design of equipment to control better the processing operations to produce paper of more uniform quality. These developments have recently permitted the preparation of written specifications for the purchase of paper, defining the standard grades in terms of specific test requirements covering composition, strength, opacity, finish, etc. It is no longer necessary for the Western Electric Company, in its purchasing and delivery inspection work, to depend entirely on samples, which may deteriorate in storage to the extent of failing to represent the qualities desired.

When paper standardization had been completed, the AT and T engineers were ready to assist the Associated Companies in converting their plain and printed papers to the standard grades. The possibilities of effecting economies in printing as well as in paper were developed by the technical men in the course of their investigations regarding qualities of paper necessary for satisfactory printing. These pertained to the many features of form design that contribute to printing economy. Since approximately 75 per cent of all stationery papers used by the Bell System are converted to printed forms, the potentialities for savings on this phase of the work were substantial.

Standard Grades Substituted

The telephone companies naturally welcomed expert assistance in the survey of their business papers. All of the many plain papers and all of the hundreds of printed forms required by each company to carry on its business in an orderly manner were systematically reviewed. The standard grades were substituted for papers in current use, with particular attention directed to whether the grade employed was most suitable in each

The advantages to a company of standardizing the qualities of paper and the sizes of the business forms it uses are clearly shown in this article describing the paper standardization program of the Bell Telephone System.

The results obtained by the Bell System are significant—pointing to the benefits which could be expected from nationally recognized standards for qualities and sizes of paper. Many small companies not only find it impossible to spend the money needed to develop a standardization program such as the one described here but also find themselves individually at a disadvantage in getting recognition and acceptance of their company's system by others concerned—for example, suppliers and manufacturers of paper.

During the past few years several informal and one formal suggestion that a national system of paper sizes be developed have been received by the American Standards Association. These suggestions have indicated that nationally acceptable standards would extend to all groups the same advantages of a standard system of sizes and qualities of paper that organizations such as the Bell System have obtained in their own field through company standardization.

case. If not, a change to another grade was specified.

Forms or plain papers that did not cut economically from standard ream-size sheets were changed, as far as practical, to sizes that would. There are a number of mill standard ream sizes for business papers, the most common being 22 x 34 inches. Eight letter-size sheets 8½ x 11 inches will cut exactly from this standard size; but if the plain paper or form were 9¾ x 12½ inches, only four could be cut from the mill size. The remainder is waste which must be included in the price of the finished product.

Odd sizes in forms often come about because they are designed from the inside out rather than the outside in; that is, the designer will draw the form and let over-all dimensions come as they will, rather than first approximating the size, selecting the nearest multiple of standard ream size, and then designing the form within it. From the attention to size, not only more economical

S

est
sta
etc
wo
to
of
tio

bu
ha
pa
pri
ity
lie
qu
ear
tra

tio
We
pic
firs
con
typ
ele
exp
of
for
rep

cid
tio

but also more practical and better looking forms have resulted.

The use of colored papers to designate the second, third, or fourth copies of forms and for other purposes was minimized in the surveys because, if used too widely, colors lose their significance: pink may have a certain significance with respect to one form but quite a different meaning in the case of another. Colors also add to the cost; for example, a form made up of four copies, each of a distinguishing color, involves extra expense for printing, since each must be run separately and then collated into sets.

It was sometimes found that separate copies of forms bore minor differences in printing. As far as the printer was concerned, each copy represented a different job, and the important factor of quantity in printing economy was diminished by these minor differences. Other items contributing to extra expense of forms were eliminated as far as practical, such as two-color printing, printing on both sides of a sheet, numbering, perforating, and others.

Establish Specifications

As each form was reviewed, specifications were established to cover the usage, size, grade of standard paper, color of ink, punching, binding, etc. With this information set up, the ground work was laid for the Western Electric Company to take up again its plan for centralized buying of business papers in the performance of its function as the service of supply for the Bell System.

Coincident with the surveys of each company's business papers, the Western Electric Company had set up supply arrangements for the standard paper grades. These permitted it to furnish the printers with papers of certain standards of quality at definite prices. The printers were thus relieved of responsibility for both paper cost and quality, which had been primary obstacles in the earlier attempts at establishing satisfactory central supply arrangements.

As each survey was completed and specifications were drawn up for all stationery forms, the Western Electric Company buyer stepped into the picture to negotiate with the printers. One of the first questions presented was the handling of the composition for each form. Setting a form in type, or ruling it in wax in order to make an electrotype plate for printing the form, is a basic expense which applies regardless of the number of copies to be printed. With the hundreds of forms involved, the total cost for composition represents a substantial sum.

In order to protect this investment, it was decided to produce a master plate, for a small additional cost, which was set aside as the telephone

company's property. The printer was permitted to prepare his printing plates from the master and to use it for replacing plates that became worn or damaged. Telephone company ownership of the master plates also facilitated competition in arranging contracts, for otherwise a new printer would have to reset all composition in order to make printing plates for his own presses—a handicap that would practically preclude a successful bid.

Usage Determines Quantity

It will be recalled that, in making up specifications for each form, usage was included. In the case of forms having a continuing demand—the great majority—this represented annual usage. Based upon this figure, definite stocks were determined upon, which the printer was authorized to establish and maintain during the life of his contract. These were called authorized stocks. They were intended to assure prompt service to the telephone company and to give the printer the equivalent of standing orders which he could use in arranging manufacturing schedules for most economical production.

Since the authorized stocks established the manufacturing quantities, they also established the quantity upon which the price of each form was based. The stocks were normally set to last three to four months, although for forms of limited use, where the small quantity might involve excessive printing costs, the stocks were for longer periods. The authorized stocks permitted the printer to level his production, and to keep his organization busy replenishing the telephone company's withdrawals at times when his business from other sources was slack. The stocks were drawn on by the telephone company as required.

Printers Favor Plan

The plan of having standard papers, specifications for each form, master plates, and authorized stocks, met with considerable favor among printers. Opportunities were afforded for savings in manufacture which were reflected in the bids submitted by the printers to the Western Electric Company's buyer, and very substantial reductions in the cost of business papers to the telephone companies resulted.

Purchase arrangements have undergone simplification over the years, until today printing for Bell System business papers is purchased literally on a square-inch basis. The specifications continue to be used, a little more inclusive perhaps, but essentially the same, including a price for each individual form.

The price for printing each form, however, is

based on its square-inch area. In submitting bids, the printer establishes his printing prices, or press work schedule as it is called in the trade, in tabular arrangement according to square-inch area and quantity to be printed. The table shows that a form of 100 square inches in 5,000 quantity costs one price, in 10,000 quantity another, etc. Composition and electrotype plate charges are also set at flat rates per square inch. Paper is priced on a pound basis, as formerly, according to the maximum number of cuts obtained from standard size sheets.

Definite scales of prices are established for other operations, including padding, collating, punching, binding, etc. This procedure greatly simplifies pricing of existing forms and permits immediate pricing of most new ones. It eliminates entirely the tedious task under the old contracts of pricing each form individually, or at the same figure as another of the same size, quantity, style, and paper quality. Lithographic or offset printing has also come into general use as a supplement to type printing, especially for the reproduction of statistical charts and of material prepared by typewriter.

Reduces Cost of Papers

The plan for simplifying paper requirements by standardizing an adequate range of grades, for the elimination of costly and frequently non-essential printing operations, and for centralized

supply arrangements has resulted in a very material reduction in the cost of business papers to the Bell System—cost representing an annual expense of several million dollars.

Formerly, the hundreds of forms used constituted hundreds of separate problems and purchase transactions for each telephone company. Today the problem has been reduced to the review of a chart for paper selection and to the review of specific instructions for the economical design of forms from a printing standpoint. The Western Electric Company has reduced purchasing to the arrangement of a contract covering a period of one year or more for each company.

In addition to the very substantial monetary savings, there is the assurance that the paper grades used are those best suited to the requirements, and, equally noteworthy, there is an immense saving of time through this more efficient and orderly procedure for seller, buyer, and consumer.

Much has been accomplished. It would appear that another story of what cooperation and the persistent pursuit of a clear-cut objective can accomplish is ended. But not so; for continued study is made of possible changes in the plans described, to effect further simplification and economy. As improvements are brought about, they have served as the vantage point from which to look beyond present horizons to future opportunities for progress through the cooperative effort of all concerned.

Underwriters' Laboratories Issue New and Revised Requirements

The Underwriters' Laboratories, Inc. have recently issued standards covering rectifiers, electric flatirons and ironing machines, branch-circuit and service circuit-breakers, and specialty transformers.

The approval requirements for rectifiers is the first edition of the standard. It covers portable and stationary rectifiers for battery charging, motion-picture arc supply, signaling, and similar purposes to be used on lighting and power circuits in accordance with the National Electrical Code. The requirements are based upon records of tests and field experience, and are subject to revision as it becomes necessary.

The requirements for electric flatirons and ironing machines are a revision of the requirements published in 1936 and take effect immediately as the basis for approval by the Laboratories. They do not cover irons rated at more than 600 volts.

The requirements for branch-circuit and ser-

vice circuit-breakers are being published for the first time by the Underwriters' Laboratories. The requirements apply to circuit-breakers specifically designed to provide service-entrance, meter-service, or branch-circuit protection in accordance with the National Electrical Code.

The new edition of the requirements for specialty transformers before being approved by the Laboratories' Electrical Council was discussed with the manufacturers of specialty transformers and others known to have an interest in the specifications. The requirements cover air-cooled transformers and reactors for general use and for use with mercury-vapor lamps, sun-lamps, etc.; bell-ringing transformers; oil-burner-ignition transformers; gas-tube-sign transformers for use with inert-gas tubes; and toy transformers.

Copies of the Standard for Rectifiers, Standard for Electric Flatirons and Ironing Machines, Standard for Branch-Circuit and Service Circuit-Breakers, and Standard for Specialty Transformers can be ordered from Underwriters' Laboratories, Inc., 207 E. Ohio Street, Chicago, Ill.

Spray Residue Tolerances For Apples and Pears

The Federal Security Agency has announced that, effective immediately, spray residue tolerances for apples and pears are set at 0.05 grain of lead per pound and 0.025 grain of arsenic (as arsenic trioxide) per pound. This regulation applies to all apples and pears shipped within the jurisdiction of the Federal Food, Drug, and Cosmetic Act. It does not apply, however, to any food commodity other than apples and pears.

These new spray residue tolerances for apples and pears revise the previous order of the Secretary of Agriculture of September 1938, which was based upon a progress report of the United States Public Health Service submitted at that time, placing the limit for lead at 0.025 grain per pound.

The new tolerances are the result of an intensive three-year study made by the Public Health Service, completed recently. Included in the investigation was a study of 1,231 men, women and children, who lived in a district where large quantities of lead arsenate are used, and have been used for over 30 years, as an insecticide on apples and pears. This field study was supplemented by laboratory studies.

"In the light of those investigations," the Acting Surgeon General of the Public Health Service reported, "it is the opinion of the Public Health Service that a tolerance of lead arsenate on apples and pears may be placed at 0.05 grains per pound for lead, and for arsenic (arsenic trioxide) at 0.025 grains per pound without endangering the health of the consumers. The Public Health Service would not feel justified in stating that tolerances higher than these might not endanger the health of the consumer."

The Public Health Service did not include fluorine sprays within the scope of its investigation and the tolerance for fluorine will therefore, for the present, remain at 0.02 grain of fluorine per pound as previously set by the Secretary of Agriculture.

Revision Clarifies Grades Of Handles Made of Ash

The changing of the designations for the three basic grades of ash handles from XX, X and 1, to A, B, and C, and the subdividing of the three grades, have been provided in the current revision of Simplified Practice Recommendation R76, Ash Handles. The revision has been given the re-

quired degree of acceptance by the industry and became effective August first, according to an announcement by the Division of Simplified Practice, National Bureau of Standards.

The three grades are subdivided to provide handles suitable for forks, rakes, hoes, and kindred farm and garden tools, and shovels, spades, and scoops. Provisions covering stems (short handles used to make D handles) are added. Another addition to the recommendation is the defining of the weights of wood falling in each grade in terms of pounds per cubic foot rather than as heavy, medium, and fair as formerly specified. Definitions of blemishes have been added, and other features of the recommendation clarified.

Until printed copies of the Simplified Practice Recommendation, R76-40, are available, mimeographed copies may be obtained without charge from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

The changes in the revision, it is believed by the industry, will promote a more definite understanding of use requirements and thus, a wiser use and conservation of ash, according to the announcement by the Division of Simplified Practice.

Revised Recommendation For Coated Abrasive Products

The Simplified Practice Recommendation, R89-36, covering Coated Abrasive Products is now being revised and copies of the proposed revision have been mailed to producers, distributors, and users by the Division of Simplified Practice of the National Bureau of Standards, according to an announcement by the Division of Simplified Practice. When those concerned have given the necessary approval, the revision will go into effect and the recommended number of stock varieties of coated abrasive products will thus be reduced by more than 100 varieties.

In 1928 a survey disclosed the existence of more than 8,000 varieties of coated abrasive products in use. A general conference of manufacturers, distributors, and those who used the products then drafted a simplified practice recommendation which reduced the number of stock varieties to 1,923. Two revisions have been approved since then.

Mimeographed copies of the present proposal for revision may be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

Man's Love Of Round Numbers

STRANGE as it may seem, we like some numbers so well, and we dislike other numbers so much, that these likes and dislikes have made indelible marks in the world of affairs.

They have an important—sometimes a controlling influence in standardization matters. The development of an American Standard on rounding off numerical values makes a discussion of these matters timely.

We have a kindly feeling for numbers ending in 0 or 5; for example, they come out even when we count them on our fingers. We think of 10, 40, 50, 75, 100, and 1,000 as *nice* numbers. Even numbers are *nicer* than odd numbers. We say 6 or 8, 10 or 12, 30 or 40, 50 or 100, *not* 7 or 9, *not* 11 or 13, *not* 29 or 41, *not* 51 or 99.

One reason we like an even number better is that we can take half of it without having to bother with fractions. Hence it seems simple and easy, and we like simple and easy things.

That in turn is the reason we like *small* numbers. We can master them and play with them with little effort. This is especially true of the first ten digits.

Many people go to great pains to secure simple, easily remembered numbers for their telephones, 1000, or 1212, which is easy to dial.

Others strive to get small numbers assigned to them for their automobile license plates. Not only are they easy to remember, but psychologists tell us there are more subtle reasons back of the desire for such numbers—the “lift” we get from the feeling we have of being near the head of the list—to say nothing of being classed, even in this indirect way, among the bigwigs for whom such numbers are usually reserved.

We have an unfriendly feeling toward prime numbers generally; 17—23—37—43—59—67 are forbidding just because they are indivisible. They make us feel discouraged because we can do so little with them. On the other hand we have a friendly feeling for numbers like 12—16—20—24—36—60—64, which can be reduced to the simple factors 2—3—5. Especially do we like those having symmetry, like 36. The powers of 2 are especially *nice*, and the fractions $\frac{1}{2}$, $\frac{1}{4}$, $\frac{1}{8}$, etc. partake of this attractiveness.

“Lightning Calculators” or “Mathematical Prodigies”

A pronounced fondness, during childhood, for such simple numbers, which lend themselves

Publication of the new American Standard Rules for Rounding Off Numerical Values leads to reflections on some consequences of our liking for and dislike of certain numbers

by

P. G. Agnew

Secretary, American Standards Association

readily to arithmetical manipulation, seems to be an essential condition in the development of so-called “mathematical prodigies” or “lightning calculators.” It appears that they start in playing with numbers for which they have a liking at an early age—even numbers, numbers that can be factored into 2’s and 3’s; squares, and cubes, and with favorite combinations of numbers.

Some of these prodigies attain the ability to perform unbelievable feats of memory and of arithmetical calculations. Speaking of a prodigy named Finkelstein, Sandor says, “He has a sentimental attitude toward numbers which considerably facilitates his arithmetical operations; he lives in a world of numbers, preferring certain numbers and groups of numbers and disliking others. He knows π to 200 places of decimals, knows logarithms of 1 to 100 to seven places, knows numerous powers of numbers of two or three digits—can carry out the addition of numbers of ten to fifteen digits with astonishing rapidity.”¹

The greatest of the mathematical prodigies was Dase who, on one occasion carried out the operation mentally of multiplying two numbers of a

¹Bela Sandor: *Character and Personality*, 1932, vol. 1, p. 70, “The Functioning of Memory and the Methods of Mathematical Prodigies.”

For a discussion of devices used by mathematical prodigies, see Victor Brandenbourg: *Les Calculateurs Prodiges et leurs Expédients*; *Bulletins et Memoires, Soc. d'Anthropologie de Paris*, 1916, p. 245.

hundred digits each. It took him $8\frac{3}{4}$ hours.

Only a very few of these prodigies have been mathematicians, the outstanding exception being the great mathematician Gauss. A few have been actually illiterate, though possessing remarkable powers in arithmetical calculations.

A Factor in Education

Our inherent love of these round numbers plays a less spectacular but more important part in the education of boys and girls than it does in the creation of prodigies.

To enjoy playing with numbers we like, to add, to multiply, to divide, and to square them, and thereby to experience the zest of gaining power over these things—this is the very essence of education.

To the small minority whose liking for such numbers is particularly keen, engineering or the mathematical sciences may have a special appeal.

Nominal Sizes and Gage Numbers

The desire for simple, whole numbers as identifying designations has led to the extensive use of gage numbers for manufactured products in which there are series of sizes. Among the best known gage numbers are those for wires and sheet metals.

Up to a certain point, gage numbers lead to economy of mental effort since only small whole numbers have to be remembered. Also, fewer mistakes are made than there would be in the use of fractions. However, it is often necessary to know the dimension as well as the gage number. We then have to know two things when only one is needed. The gage number becomes excess baggage, and results in a waste of mental effort.

This is not the only field in which our love of round numbers has been pushed to a point of conflict with efficiency. As we shall see later, this dilemma in the use of gage numbers can be bridged by the use of Preferred Numbers.

A striking illustration of our love of simple, round numbers is to be found in the use of nominal sizes, which are in a sense similar to gage numbers. The outstanding examples are in pipe diameters and in widths and thicknesses of lumber. The following examples of "standard weight" steel pipe are typical of the smaller sizes:

Size Nominal Inside Diameter (in inches)	Actual Diameters	
	Inside (in inches)	Outside (in inches)
$\frac{1}{8}$	0.269	0.405
$\frac{1}{4}$	0.622	0.840
1	1.049	1.315

It will be noted that the one-eighth inch pipe is more than a quarter inch in inside diameter.

Nominal sizes for lumber arose in part from

Rules for Rounding Off Numerical Values have just been issued by the American Standards Association (Z25.1-1940). The most interesting feature of the new standard is that it emphasizes the correct rule for rounding decimals which end in 5. An incorrect rule for doing this is taught in most public schools.

The American Standard Rules are provided with explanatory notes and numerical examples.

Copies of the new standard are available from the American Standards Association at 20 cents each.

the decrease in size when a board is dressed, but also in part from the skimping of sizes under keen competition. "How thick is a one-inch board?" was the question in "the war of the thirty-seconds," as Mr. Hoover termed the controversy over the question. This particular battle was a draw, and so some groups now make a nominal 1 in. board $25/32$ in. thick and some make it $26/32$ in. thick.

The traditional "two by four," as another example, is now $1\frac{5}{8}$ in. by $3\frac{5}{8}$ in. in actual dimensions (or $1\frac{5}{8}$ in. by $3\frac{1}{2}$ in.; or $1\frac{3}{4}$ in. by $3\frac{1}{2}$ in.; or $1\frac{3}{4}$ in. by $3\frac{5}{8}$ in. if intended for certain special uses).

In children's garments, the trade uses nominal sizes in the form of a series of numbers which are supposed to represent the age of the child to be fitted, but as there has never been an agreement upon the actual sizes of the body or of the garments, the whole matter is in a chaotic state. Some manufacturers are beginning to put actual garment dimensions on the labels. A committee of the American Standards Association is working on the development of a standard series of body sizes, basing its work on research work of the U. S. Bureau of Home Economics. The desire of the trade for simple rounded numbers is a factor in the undertaking.

Preferred Numbers

There are many fields in which there is need of a series of sizes of a product, such as rods of different diameters, sizes of structural steel, frying pans, pumps, electric motors, bolts and nuts, and nails.

Our human preference for simple, whole numbers naturally leads to the selection of round numbers for the series of sizes. It is obvious, however, that in large scale production important

economies may result from the selection of the best possible sizes and the best possible spacing between sizes. This calls for a science of sizing applicable to series of sizes. A start has been made toward such a science through the development of a series of "Preferred Numbers." This series has been adopted by the national standardizing bodies of a number of countries, including the American Standards Association. The series provides five basic steps between 10 and 100, *viz*: 10, 16, 25, 40, 63, 100. This is known as the "5-Series." These, together with five intermediate steps provide a "10-Series" where closer spacing is called for. Additional intermediate steps provide a "20-Series" and a "40-Series" where still finer spacing is needed.

This series represents a carefully worked-out compromise between the human desire for extremely simple, round numbers and the engineering aspects, so as to give the best possible over-all industrial economy in production and use.

For example, from the standpoint of simple numbers alone, equal spacing, using even integers; *e.g.* 3, 10, 12, 14, 16, etc. has often been used. An early published standard for very large pipe followed this plan. Yet analysis shows that in the general case maximum economy requires *equal ratios between successive sizes*. This means that the series shall be a geometrical one and thus have equal percentage increases between sizes.

As an illustration, suppose it has been decided that five sizes of general-purpose motors are needed to bridge the span from 10 to 100 horsepower. It can be shown mathematically that the greatest over-all economy in the use of material and labor will be obtained if the motors increase in power by a constant ratio between successive sizes. The sizes then become 10, 16, 25, 40, 63, 100 horsepower respectively. This is a 60 per cent increase from size to size. In the 5-Series of Preferred Numbers the steps are approximately 60 per cent; in the 10-Series, 25 per cent; in the 20-Series, 12 per cent; and in the 40-Series, 6 per cent. Larger or smaller sizes are obtained by merely shifting the decimal point.

This type of spacing which gives equal ratios between steps has a physiological basis. For example, if in lifting a given weight the least increment that can be detected is one ounce, then in lifting a weight twice that size the least increment will be 2 ounces, and in a weight ten times that size the least increment will be 10 ounces. This is called the "psycho-physical law."

Because of the extensive use of fractional inch sizes in this country the American Standard Preferred Numbers include a fractional system of numbers.

To many people there is a great charm in numbers ending in 0 or 5—and a still greater attrac-

tiveness in the basic device of the Arabic system of notation—the decimal point and use of 0.

To many others there is equal attractiveness in the powers of 2 and the powers of $\frac{1}{2}$.

The Metric System

I believe that the emotional attitudes of members of both these groups toward certain numbers and groups of numbers have in the past been factors in the metric controversy, and that they have all too frequently brought heat rather than light into discussions of the subject.

An early incident emphasizes the importance of man's love of round numbers. In the early stages of the metric system, Sir Joseph Whitworth tried to persuade the French to make the meter just 40 inches. Had this been done we would now have both the metric system and the inch system confined into a single consistent system having all the advantages of both the inch and the millimeter. But the desire to have the new system based upon the theoretical value of one ten-millionth of a quadrant of the circumference of the earth prevailed.

Denominations of Coins

Each country has chosen simple multiples and submultiples of its monetary unit for its coinage. In numerous lines of commodities, manufacturers have concentrated production on articles of such size and quality that they may sell at retail for a price represented by a definite coin. The five and ten cent stores of this country provided an outstanding example.

Prior to the World War this effect was noticeable in international competition as between the franc, the mark, and the shilling. It is still a factor in trade between this country and Cuba, which has a 20 cent coin but no 25 cent one.

Most limited-price stores set their maximum selling price of any article at the value of a coin, as 10 cents, 50 cents, or \$1.00.

Many large stores have established a series of preferred prices for the guidance of their staffs in much the same way that the American Standard Preferred Numbers are used in technical matters.

Certain widely used price numbers such as 49 cents, 98 cents, and \$1.95 have an emotional connotation, but a different one from that which attaches to those already discussed. This is, of course, the inference that they are either reduced prices or cut prices.

The age-old custom of charging the customer a full cent for any fraction of a cent in all commercial transactions is another type of rounding. The commercial justification for this practice is easily seen from an illustration. If a merchant

is selling lemons for 25¢ per dozen, the exact value of a half dozen is 12.5¢. If he were to charge but 12¢, his price for lemons would in effect be reduced to 24¢ per dozen, and a customer could secure this price by asking for two half-dozen. The same reasoning would apply to a quarter dozen or even one-twelfth of a dozen. Furthermore, the cost of selling in small quantities is greater.

The "rule" that the person who makes the change takes the extra half cent in case the fraction is exactly a half cent seems to be seldom followed. The habit of the fractional cent going to the "house," not to the customer, seems to be well-nigh universal.

New Standard for "Rounding Off" Numerical Values

Everyone is familiar with the process of "rounding off" decimals so as not to be bothered by carrying unnecessary figures that are not justified by the accuracy of the data. Most people, however, are not familiar with the fact that the method usually taught in the public schools is erroneous in one important particular. Rules for Rounding Off Numerical Values have just been issued by the American Standards Association. The most interesting feature of the new standard is that the correct method of rounding is emphasized in it. The particular point is how the rounding is to be done when the excess figure is a 5. The method generally taught in the schools is to round to the next highest figure in all cases. This is obviously wrong since on the average it will lead to cumulative errors. Nevertheless, it is used by the public generally, by most engineers, and even by professors of engineering!

The correct method, which is used in statistical work and in precise scientific calculations, is to round to the even figure; e.g., 3.25 is rounded to 3.2; 0.215 is rounded to 0.22; 6.75 to 6.8. The new standard sets forth this method and the reasons for it with meticulous care.

A simple illustration will make clear how the unscientific method of simply taking the next higher figure leads to cumulative errors. Let us divide the odd numbers from 1 to 13 by 2, then round the quotients by each of the two methods, add, and multiply by 2. The problem is

$$(0.5 + 1.5 + 2.5 + 3.5 + 4.5 + 5.5 + 6.5) \times 2 = 49$$

By the incorrect method (taking the next higher figure) we have

$$(1 + 2 + 3 + 4 + 5 + 6 + 7) \times 2 = 56$$

By the correct method (rounding to the even figure) we have

$$(0 + 2 + 2 + 4 + 4 + 6 + 6) \times 2 = 48$$

The error in rounding by the correct method is but 1; while by the incorrect method it is 7.

The new American Standard Rules for Rounding Off Numerical Values was prepared at the request of a general conference called together by the American Standards Association to consider the approval of the American Standard Practice for Inch-Millimeter Conversion for Industrial Use. Because this inch-millimeter conversion standard comprises a method of rounding off decimal values, it was decided that it would also be helpful to establish standard rules for carrying out the method of "rounding off." As a result of this decision, the committee which prepared the draft of the inch-millimeter conversion standard was invited by the conference to prepare also a separate standard giving rules for rounding off numerical values.

The members of the committee which prepared both standards are:

C. B. Veal, Society of Automotive Engineers,
Chairman

L. F. Adams, National Electrical Manufacturers' Association

H. W. Bearce, National Bureau of Standards

F. O. Hoagland, National Machine Tool Builders Association

C. E. Johansson, Ford Motor Company

C. B. LePage, American Society of Mechanical Engineers

Paul V. Miller, Gage Manufacturers' Association

Mr. Bearce of the National Bureau of Standards served as a drafting subcommittee of one for the American Standard Rules for Rounding Off Numerical Values.

Similar results will be found by taking numbers at random.

In regard to the number of places to be retained the following rule is given:

"In engineering and industrial work a good general rule to follow in regard to the number of places to be retained is, at each step in a calculation involving several steps, to retain one more place than is required to maintain the precision represented by the least precise factor involved. The final value should be cut off at such a point that only the figure in the last place retained is in doubt."

It is made clear that any such general rule will not suffice for all conditions. The Rules are provided with explanatory notes and with numerical examples, including a long column of 6-place numbers, all rounded successively to 5, 4, 3, 2, and 1 places.



*ELECTRICAL COMMITTEE OF THE
NATIONAL FIRE PROTECTION ASSOCIATION
RECEIVING ROOM - HARBOR HALL
ATLANTIC CITY N.J. DECEMBER 5, 1939.*

The 1940 National Electrical Code

ADOPTED in May as the current standard of the National Fire Protection Association and of its publisher, the National Board of Fire Underwriters, the 1940 edition of the National Electrical Code was declared an Approved American Standard (C1-1940) by the American Standards Association on August 7.

This edition represents many advances in safeguarding life and property and furthermore recognizes several important new developments in the application of electricity to heating and lighting of premises and to power and signalling problems. Outstanding is the recognition of new rubber compounds for insulation of conductors, which may safely operate at higher conductor and ambient temperatures without serious loss of physical and insulating properties.² Thus, the allowable ampere loads are safely increased. For the so-called "heat resisting" grade of rubber insulation, these savings due to increase in allow-

¹President, Underwriters' Laboratories, Chicago.

²Until this edition of the Code was approved, a temperature limit of 50 C, 120 F has been the only one recognized as the temperature which rubber insulation could withstand. In the new, 1940, edition, three grades of rubber insulation are recognized, two of which permit operation at higher temperatures. One grade can be safely operated at 75 C; one at 60 C; and the third is the grade recognized in earlier editions to be operated at 50 C.—EDITOR.

Recognizes new developments in using electricity for heating and lighting as well as for power and signalling

Authorizes use of new rubber compounds which insulate safely at higher temperatures, allowing increased ampere loads

able current, and additional economies due to reduced small diameters of the complete conductors, are made available without special limitations. Adding to these economies is the limited recognition given certain other such compounds when the insulation thickness is substantially reduced, in some cases as much as one third.

Then, too, the new edition recognizes conductor insulation made from the so-called synthetics and the economies of higher current values and lowered conductor diameter appear with their use.

Definite progress appears to have been made in discouraging overfusing circuits. It is ex-

pected that the new so-called "Type S" plug fuse of a tamper-resisting design will be generally available well in advance of the date, November 1, 1941, specified for its mandatory use.

The text of Article 250 covering protective grounding of circuits and equipment was completely rewritten. Its provisions, while not materially modified, are presented in a greatly improved editorial arrangement.

Occupancies and conditions when enameled coatings or finish for raceways are judged such that corrosion will not impair safety and service are indicated.

Certain wiring methods that have become obsolete are omitted. A new wiring method utilizing as raceways the hollow spaces of cellular steel floor construction is recognized with detailed provisions for safeguarding.

Details for installing circuits and equipment for interior display and decorative lighting with gaseous tubes at high voltages record another instance of Code recognition of a new development.

The Electrical Committee of the National Fire Protection Association qualifies as a sectional committee according to American Standards Association procedure. At present the National

NFPA Heads Work On Electrical Code

The National Electrical Code was prepared and is kept up-to-date by a committee working under the sponsorship of the National Fire Protection Association. President of the NFPA is Alvah Small, who is also chairman of the National Electrical Code committee and president of Underwriters' Laboratories.

The 1940 edition of the Code is being published by the National Board of Fire Underwriters, and copies will be available within the next few weeks at five cents each.

Electrical Code contains 60 subdivisions called Articles. Each Article is in the charge of a subcommittee of the Electrical Committee. For the studies preparatory to the 1940 edition of the Code 40 separate Article subcommittees had referred to them suggestions from the industry for additions or other changes from the existing 1937 text. The reports of these subcommittees were published in August, 1939, in an edition of 7,000 copies. These reports were discussed at meetings of inspectors throughout the country. Various industry groups gave them additional critical study. Following the meeting of the Electrical Committee in December, attended by over 100 committee members and alternates and industry representatives, a copy of the galley proof for the new edition was circulated by the sponsor and discussed before adoption at its annual meeting.

The procedure of the Electrical Committee provides for special committees which consider special problems arising out of developments of the electrical industry. Two such committees reported in December but without recommendations for changes in present Code provisions. Their subjects were timely and their reports, covering respectively The Grounding of Portables and Transformers and Transformer Vaults, will no doubt prove of great value subsequently.

Even a short account of the 1940 edition of the National Electrical Code should include mention of the very important contribution made to the Code, to the work of the Electrical Committee and to all concerned with the installation and use of electricity by the National Electrical Manufacturers Association in Reports on Investigation of Small Diameter Building Wire, Determination of Maximum Permissible Current-Carrying Capacity of Code Insulated Wires and Cables for Building Purposes, and on All-Synthetic Insulation.

by Alvah Small¹

*Chairman, Sectional Committee for
the National Electrical Code*



Revised Commercial Standard For Douglas Fir Plywood

A revision of the Commercial Standard for Douglas Fir Plywood was drafted recently and distributed to those concerned. The National Bureau of Standards now announces that signed acceptances have been received from enough manufacturers, distributors, and users to comprise a satisfactory majority. The Standard is known as Douglas Fir Plywood (Domestic Grades), CS45-40.

The Commercial Standard is effective for new production beginning August 20. Mimeographed copies, designated TS-2883, may be procured from the National Bureau of Standards, Washington, D. C., free of charge. When printed copies are published they will be available from the Superintendent of Documents, Government Printing Office, Washington, D. C.

The Standard was drawn up because of the extended application of Douglas fir plywood to a large number of new uses. Its purpose is to form a universal basis of understanding in the industry. According to a statement by the National Bureau of Standards it is expected that general adoption and use of this standard will facilitate procurement of the proper grade of material and the proper type as to moisture resistance for its varied uses and provide a better understanding between architects, engineers, contractors, industrial users and home owners.

Consumer Adviser Is Asked To Study Standards

At a conference of national organizations held by the Consumer Adviser of the Advisory Commission to the Council of National Defense August 1-2, the session on consumer-buyer problems made the following recommendations for consideration by the Consumer Adviser's office:

1. That accurate, up-to-date information be made available on the prices and quality of consumer goods, and on the general situation with regard to inventories and supplies which may affect prices.
2. That consumer groups be aided in developing the necessary understanding and interest to get such information used effectively.
3. That, since information as to the quality of consumer goods is particularly necessary in a period when quality changes and substitutions are likely, existing standards for consumer goods should be compiled and disseminated widely among consumer groups; that the cooperation of

business people in the use of standards should be sought. Where standards are not available, informative labeling should be considered and new standards developed.

4. That the Consumer Adviser's office consider steps to prevent unwarranted increases in price.

The discussion in the session on Consumer-Buyer Problems was led by Mrs. Saidie Orr Dunbar, President General of the Federation of Women's Clubs.

New Australian, Canadian, and British Standards Received

The Library of the American Standards Association has received copies of new and revised standards from Australia, Canada and Great Britain. These are listed below. Copies of the standards may be borrowed by ASA members.

Australia

Definitions and general requirements for electrical materials and equipment (C 100-1940)

Canada

Nominal sizes and dimensions of wood screws (B65-1940)
Supply lines and trolley lines crossing railways (C22.3 No. 1(A)-1940)
Communication lines crossing railways (C22-3 No. 1(B)-1940)
Metallic arc welding—bridges and buildings (S59-1940)

Great Britain

Steel plates for fireboxes of locomotive boilers (24-Part 6, Specification 16X-1940)
Dimensions of instrument jewels (904-1940)
Anti-interference characteristics and performance of radio receiving equipment for aural and visual reproduction, excluding receivers for motor vehicles and marine equipment (905-1940)
Engineers' parallels—steel (906-1940)
Dial gauges for linear measurements, excluding back plunger type (907-1940)
Sisal ropes for general purposes (908-1940)
Ethylene glycol (D 34)
Cotton duck, dyed, for cases and travelling bags for parachutes (2 F 55)

Revised

Tungsten filament general service electric lamps (161-1940)
Bronze (gun metal) ingots and castings for general engineering purposes: 88/10/2 bronze (gun metal) ingots; 88/10/2 bronze (gun metal) castings (382-1940 and 383-1940 published in one volume)
Manila ropes for general purposes (431-1940)
Components for radio-interference suppression devices, excluding devices for traction, marine and other special equipment (613-1940)

Air Raid Precautions Standards

Stirrup pumps (BS/ARP 33)
Traffic paints (BS/ARP 38)

ASTM Submits Revisions For American Standards

REVISIONS to approved American Standards, adopted by the American Society for Testing Materials as a result of recommendations made by ASTM committees at its annual meeting, are being submitted to the American Standards Association for approval. These standards were originally prepared by ASTM committees and approved by the American Standards Association at the request of the American Society for Testing Materials. Authority for revising them was assigned to the ASTM by the ASA under the proprietary standards method. Under this method, when such standards are submitted by the ASTM for approval the ASA reviews the record to insure that, through the ASTM committee and such other contacts as the ASTM may have found necessary, a consensus has been reached on the technical content of the standard.

The revised standards which have just been submitted by the American Society for Testing Materials are:

- Mineral Iron Oxide (K25-1937; ASTM D 84-27)
- Chrome Yellow (K27-1937; ASTM D 211-27)
- Reduced Chrome Green
(K28-1937; ASTM D 213-27)
- Prussian Blue (K29-1939; ASTM D 261-39)
- Reduced Para Red (K31-1938; ASTM D 264-39)
- Chrome Oxide Green (K37-1937; ASTM D 263-28)
- Gypsum Plasters (A49.3-1939; ASTM C 28-39)
- Gypsum Molding Plaster
(A49.4-1933; ASTM C 59-30)
- Gypsum Pottery Plaster
(A49.5-1933; ASTM C 60-30)
- Carbon-Steel Castings for Valves, Flanges, and Fittings for High-Temperature Service
(G17.1-1936; ASTM A 95-36)
- Forged or Rolled Steel Pipe Flanges for High-Temperature Service
(G17.3-1939; ASTM A 105-39)
- Sampling and Analysis of Coal and Coke
(K18-1937; ASTM D 271-37)
- Sampling Coal for Analysis
(X1-1921; ASTM D 21-16)

Requirements for moisture and other volatile matter present in the pigments both in the dry form and as a paste in oil have been added to the standards in the revisions of the specifications for pigments. The earlier specifications, it is explained, usually included a requirement for moisture in the pigment in paste form, but not in the dry pigment, which is its principal source. Moisture requirements appearing in the original specifications are not consistent with those actually found in the products offered to the trade.

In the case of chrome oxide green (dry pigment) the moisture requirements have been changed as in the other pigment standards. In

addition, a change has been made in the proportions of pigment and oil required. This change was necessary because the dry pigment for chrome oxide green now available to the trade has such high oil absorption that the original proportions of pigment and oil required in the standard make a paste entirely too stiff for satisfactory use.

Revisions to the gypsum specifications require that the gross weight be shown on each package or tag in addition to the net weight, since most state laws require that the gross weight be shown.

Revisions in specifications for carbon-steel castings for the flanges (G17.1-1936) modify the marking clauses to make them consistent with requirements of the Manufacturers Standardization Society of the Valve and Fittings Industry.

In the forged or rolled steel pipe flange standard (G17.3-1939) a change has been made in the title, and minor changes in two or three requirements will bring the specifications up-to-date with current practice.

Sampling procedures have been changed in the methods of sampling coal (X1-1921 and X18-1937) to make them consistent with other methods of coal sampling.

Foreign Draft Standards Received by ASA Library

Drafts of proposed standards have been received recently from several foreign countries. These are listed below. They are published in the language of the country from which they were received.

Australia

Cutlery, Spoons and Forks To be No. 10-6-2

Great Britain

Precision Levels for Engineering Workshops
Engineers' Squares CF (ME) 5599 CF (ME) 6289

Italy

Stop Screws and Special Type Bolts and Nuts
Threaded Plugs for Castings UNI 0300
Standardization of Shipbuilding Details; Slips
UNI 0310

New Zealand

New South Wales Hardwoods No. D 1177
Portable Fire Extinguishers of the Carbon Tetrachloride Type No. D 1373

The above draft standards may be borrowed by members of the American Standards Association from the ASA Library.

Committee on Concrete Recommends Standards and Good Practice

A report which records many advances in design, construction, and specification practice for concrete and reinforced concrete structures was released for publication June 15 by the Joint Committee on Concrete and Reinforced Concrete. Although the committee has not submitted it as the final word on concrete design and construction, it believes that the report reflects the best practice of the day.

This report is the third issued by three successive Joint Committees made up of members appointed by national engineering and technical organizations interested in the use of concrete: the American Concrete Institute; the American Institute of Architects; the American Railway Engineering Association; the American Society of Civil Engineers; the American Society for Testing Materials; and the Portland Cement Association.

For more than 30 years the design and building of concrete and reinforced concrete structures have been influenced by the work of these three committees. The reports of the first two committees issued in 1916 and 1924 indicated broadly the progress during the periods covered by their activities, and reflected developments in the field through recommended practices and specifications.

This third report is in three sections: Recom-

mended Practice; Standard Specifications; and Appendices.

Recent advances relating to concrete as a material, which are recognized in the report, include increase in the strength of cement; a more widespread understanding of the basic principles of mixtures with increasing attention to field control; and an increasing use of ready-mixed concrete.

In the field of design, the major development has been increased interest in rigid frame analysis which recognizes the essentially monolithic character of reinforced concrete construction and provides a more accurate method of stress computation and hence a more uniform factor of safety.

The report has been published by each of three of the cooperating organizations: The American Concrete Institute; the American Society of Civil Engineers; and the American Society for Testing Materials. It is available at \$1.50 per copy. In addition, the American Society for Testing Materials has published the report with the text of the 26 ASTM standards to which it refers. This publication, including the standards, is available from the American Society for Testing Materials, 260 South Broad Street, Philadelphia, Pa., at \$2.00 per copy. Copies of the report alone, or the report with the ASTM standards, may also be ordered through the ASA office.

Corrosion Coordinating Committee Names Speller Chairman

The second annual meeting of the American Coordinating Committee on Corrosion was held June 27 at Atlantic City. Dr. F. N. Speller of Pittsburgh, consultant on corrosion, was named chairman for the coming year. Dr. R. M. Burns of the Bell Telephone Laboratories was named vice-chairman, and Dr. G. H. Young, Mellon Institute of Industrial Research, secretary-treasurer.

The committee was organized two years ago to coordinate research activities in the field, and is patterned after similar organizations in England, Holland, Belgium, and other countries abroad. Cooperation has been promised by all the major companies and independent laboratories that are actively engaged in corrosion investigations.

At this year's meeting the American Welding Society, the Chemical Foundation, the Engineer-

ing Foundation, and the National Research Council were elected to membership in addition to the other 20 national societies which are represented.

Underwriters' Laboratories Issue Standard for Rubber-Covered Wire

A fourth edition of its Standard for Rubber-Covered Wires and Cables has been issued by Underwriters' Laboratories. The outstanding feature of the new edition is the inclusion of requirements for four new types of rubber-insulated conductors—Types RW, RHT, RPT, and RU. The Laboratories are now accepting applications for the investigation of wires and cables of all of these types. Products which comply with the requirements of the standard will be listed specifically by the type-letter designation which applies and may be labeled as such, according to the Laboratories' announcement.

ASA Approves Gas-Appliance Requirements

SUPPLEMENTING an already impressive record for 1940, which shows ten sets of approval and listing requirements for gas-burning appliances and accessories revised and adopted as American Standard, another new set and two revised sets of requirements sponsored by the American Gas Association were approved by the American Standards Association July 15. These include the American Standard Approval Requirements for Hotel and Restaurant Ranges and Unit Broilers (Z21.3-1940), the American Standard Approval Requirements for Hotel and Restaurant Deep Fat Fryers (Z21.27-1940), and an addenda to the American Standard Approval Requirements for Central-Heating Gas Appliances (Z21.13-1940). These requirements, which become effective January 1, 1941, include for the first time provisions for testing unit broilers, deep-fat fryers, and wall-register-type floor furnaces.

One of the principal revisions to the requirements for hotel and restaurant ranges is their extension to cover unit broilers. The title of these requirements has been revised to indicate their enlarged scope. New test gases and pressures have been incorporated in the revisions in line with recommendations of the Subcommittee on Test Gases and Test Pressures of the ASA Sectional Committee, Project Z21, AGA Approval Requirements Committee. These changes provide for testing equipment for use with mixed gas, which is being distributed over increasingly larger areas. Likewise, the former sections covering performance tests on propane gas have been extended to include all liquefied petroleum gases. This development will permit approval of equipment of this type for such products.

Specifications Help Consumers

Of particular interest to consumers are two new specifications which add to convenience, efficiency, and safe performance. In the interests of safety, consumers are aided in recognizing correct installation of hotel and restaurant ranges,

Provisions for testing unit broilers, deep-fat fryers, and wall-register-type floor furnaces are now included in standards for gas-appliances sponsored by the American Gas Association

by

Milton Zare

*American Gas Association
Testing Laboratories*

and unit broilers which are constructed with detachable legs or bases, removal of which may affect their operation. Such models are required to be permanently marked with the statement "For Use Only With Legs or Ventilated Base." Added convenience and efficiency are provided in a new section specifying a minimum speed of heating for hot-top ranges.

New standards covering deep-fat fryers were developed as a result of a considerable amount of study and investigation on construction and performance of contemporary equipment by the supervising committee. Concerned with types which are sold as package units for hotel, restaurant, club, and similar purposes rather than with larger deep-fat fryers which are usually engineered for given commercial application, the scope of this new American Standard was limited to deep-fat fryers with a maximum capacity of 300 pounds of cooking fluid. For this reason, they have been entitled "American Standard Approval Requirements for Hotel and Restaurant Deep-Fat Fryers."

In addition to thoroughly providing for all

necessary constructional features to insure rigidity and durability, performance tests have been developed to simulate the most extreme conditions under which they will operate in service with city gases, liquefied petroleum gases, or butane-air. Of particular interest to users of this type of gas-burning appliance are limitations on temperature rise of heated surfaces in contact with cooking oil. This prevents unnecessary scorching and thereby spoiling the cooking fluid. Likewise, temperatures near the bottom of crumb receptacles, which are a required part of all deep-fat fryers, must be at least 100 F lower than the top temperatures of the cooking fluid. This specification also prevents contamination of the cooking fluid. In addition, heating capacities must be such as to develop adequate frying temperatures within a given time from a cold start. It is felt

that compliance with these details is necessary to assure satisfactory operation under all normal conditions of use.

Revisions to the American Standard Approval Requirements for Central-Heating Gas Appliances (Z21.13-1940), adopted recently, reflect rapid progress in development of new types of heating appliances to cover consumer needs. In this category it was felt advisable to incorporate provisions to cover adequately safe use and installation of the various types of floor furnaces, particularly wall-register types. To preclude any hazard due to overheating, revisions were incorporated requiring tests for wall, floor, and flue temperatures under conditions in which they are installed in service. No part of the furnace casing, grille, or parts of the register in contact with wood or combustible wall materials may exceed a tempera-

27 Gas-Appliance Standards Now Approved by ASA

Twenty-seven standards covering approval requirements and listing requirements for gas-burning appliances have now been completed, and approved by the American Standards Association. They were developed by the ASA Committee on Gas-Burning Appliances (AGA Approval Requirements Committee), which is working under the sponsorship of the American Gas Association. These standards are used by the American Gas Association Testing Laboratories as the basis for tests to determine whether gas-burning appliances are entitled to display the American Gas Association's Seal of Approval or to be listed by the AGA as accepted appliances.

The 27 approved standards are:

Approval Requirements for Domestic Gas Ranges (Z21.1-1937)	\$1.00
Listing Requirements for Flexible Gas Tubing (Z21.2-1938)	.40
Approval Requirements for Hotel and Restaurant Ranges and Unit Broilers (Z21.3-1940)	1.00
Approval Requirements for Private Garage Heaters (Z21.4-1932)	.40
Approval Requirements for Clothes Dryers (Z21.5-1932)	.40
Approval Requirements for Incinerators (Z21.6-1932)	.40
Approval Requirements for Gas-Heated Ironers (Z21.7-1932)	.40
Installation Requirements for Conversion Burners in House Heating and Water-	

Heating Appliances (Z21.8-1933)	.40
Approval Requirements for Hot Plates and Laundry Stoves (Z21.9-1933)	.40
Approval Requirements for Gas Water Heaters (Z21.10-1938)	1.00
Approval Requirements for Gas Space Heaters (Z21.11-1936)	.40
Listing Requirements for Draft Hoods (Z21.12-1937)	.50
Approval Requirements for Central Heating Gas Appliances (Z21.13-1940)	1.00
Approval Requirements for Industrial Gas Boilers (Z21.14-1934)	.40
Listing Requirements for Gas Burner Valves (Z21.15-1934)	.30
Approval Requirements for Gas Unit Heaters (Z21.16-1934)	.40
Listing Requirements for Gas Conversion Burners (Z21.17-1934)	.40
Listing Requirements for Domestic Gas Appliance Pressure Regulators (Z21.18-1934)	.30
Approval Requirements for Refrigerators Using Gas Fuel (Z21.19-1936)	.40
Listing Requirements for Automatic Devices Designed to Prevent the Escape of Unburned Gas (Z21.20-1935)	.30
Listing Requirements for Automatic Main Gas-Control Valves (Z21.21-1935)	.30
Listing Requirements for Relief and Automatic Gas Shut-Off Valves for Use on Water Heating Systems (Z21.22-1935)	.40
Listing Requirements for Water Heater, Gas Range, and Space Heater Thermostats (Z21.23-1935)	.40
Listing Requirements for Semi-Rigid Gas Appliance Tubing and Fittings (Z21.24-1937)	.50
Approval Requirements for Gas Hair Dryers (Z21.25-1937)	1.00
Listing Requirements for Attachable Gas Water-Heating Units Without Water-Carrying Parts (Z21.26-1938)	1.00
Approval Requirements for Hotel and Restaurant Deep-Fat Fryers (Z21.27-1940)	1.00

ture of 90 F above room temperature after operating for two hours at a rate $22\frac{1}{2}$ per cent above normal input rating.

Among other revisions deemed necessary for inclusion in the new central-heating gas appliance requirements are provisions for preventing any condensate from entering the pilot line and its exposure to any damage hazards. In addition, openings for replacement of air filters for forced-air furnaces must be completely closed. Unless the required construction is designed to close by gravity or by spring tension, it is required that

the following statement shall be permanently attached: "This must be closed during operation of the furnace."

Although these requirements do not become effective until January 1, 1941, any manufacturer desiring to do so may submit his equipment for test for compliance with them in advance of that date. Copies of these standards are available from the American Standards Association. ASA members are entitled to 20 per cent discount when buying approved American Standards through the ASA office.

ASTM Honors C. M. Chapman

Cloyd M. Chapman, vice-president of the American Standards Association from 1929-1931, and chairman of the ASA Standards Council from 1931-1933, was awarded an Honorary Membership by the American Society for Testing Materials at its Forty-third Annual Meeting, in recognition of his work in developing a system of medical X-ray photography which makes it possible to examine a large number of individuals in a day at a very moderate cost.

Mr. Chapman has been a member of the ASTM since 1908 and has been active on many ASTM committees including committee A-5 on Corrosion of Iron and Steel; D-1 on Paint, Varnish, Lacquer, and Related Products; C-7 on Lime; C-9 on Concrete and Concrete Aggregates, and C-1 on Cement. He was chairman of the committee on concrete and concrete aggregates from 1926 to 1932, and also served as vice-chairman for several years. He has been chairman of Committee E-3 on Nomenclature and Definitions since 1922.

Mr. Chapman became a member of the Standards Council of the American Standards Association in 1925 representing the American Society of Mechanical Engineers, and served as a member of the Council until 1939. He is also a former Director of the American Concrete Institute and a member of the Edison Pioneers.

detail in a pamphlet published recently by the American Standards Association.

The pamphlet has already been distributed to members of ASA committees. Others working on standardization problems but who are not members of the standardization committees may also be interested in this description of the way in which ASA committees carry on their work.

Copies of the document, *The Organization and Work of Sectional Committees*, PR 27, are available to anyone interested and may be obtained by writing to the American Standards Association, 29 West 39 Street, New York.

Federal Specifications Approved and Available

The following Federal specifications have now been approved for use in government purchasing. The date after each title shows when the specification becomes effective.

Aluminum-base-alloy; die-castings. (new)
QQ-A-591 Oct. 1, 1940

Aluminum-base-alloy; permanent-molding-castings.
(new) QQ-A-596 Oct. 1, 1940

Lamps; electric, incandescent, miniature, tungsten-filament. Amendment-2 W-L-111b Sept. 1, 1940

Malt-preparations. (new) N-M-96 Nov. 1, 1940

Steel; castings. Amendment-1 QQ-S-681a Aug. 15, 1940

Wire; bale-tie, single-loop. (new) QQ-W-311
Sept. 1, 1940

Wire; steel, zinc-coated (for wire-bound boxes).
(new) QQ-W-446 Sept. 1, 1940

Anyone wishing to order copies of these specifications and amendments may do so from the Superintendent of Documents, Government Printing Office, Washington, D. C. The price is five cents each.

ASA Pamphlet Tells How Committees Develop Standards

The way technical committees operate through the American Standards Association in setting up national standards, and the steps which are followed in developing a standard, are described in

Standardization In the Steel Industry¹

IN the steel industry, standardization has not been irrationally revered, but it has not, by any means, been treated as a stranger. Almost fifty years ago the Association of American Steel Manufacturers, after due experiment and investigation, adopted a set of standards relating to the physical properties and chemical composition of boiler plate, structural steel, and rivet stock. The specifications served a useful purpose in their time, but with continual advancement in the technique of steel making and with new requirements arising in the trade, they became obsolete and have long since been superseded by others.

Standardization of products, which is logically of more direct interest to the consumer than standardization of processes, has been playing an increasingly important role in the steel industry for several decades. One of the interesting examples is the standardization effected in the series of wide flange beams, whereby the respective numbers produced by the several manufacturers are readily interchangeable. The provision of the convenient and logical geometric series of beams was, of itself, an effective move toward simplification and economy; the added feature of interchangeability enhanced the value of this whole project for the structural industry. Similar benefits were realized when sheet steel piling was rationalized as to design, then standardized, and produced in sections best suited to meet the conditions encountered in engineering practice.

Grades Set Up as Standard

Pig iron, the product of the blast furnace, is regularly produced in grades which have been set up as standard for specific purposes. Each fully integrated steelmaker may produce whatever kind of iron he chooses for his own open hearth or Bessemer operations, but he does not have any such leeway in supplying iron for foundry purposes. As a matter of fact, even in the case of the metal intended for conversion into steel, the supposed degree of freedom is something of an illusion, because economic considerations as well

Standardization of products and of processes helps reduce cost of steel by at least \$8.00 per ton

Cooperation between producer and consumer can apply benefits of standardization to orders for small users

by

R. E. Zimmerman²

Vice-president in charge of Research and Technology, United States Steel Corporation

as metallurgical factors demand that iron for open hearth and Bessemer practice be held to certain properly determined standards.

There is no point in reciting, here and now, a detailed list of steel products which have been subject to standardization either extensively or in part. Rails, tin plate, galvanized sheets and many others have been affected or covered in some respects—but certainly not to the limit. With further progress in the processes of production and utilization there is the probability that additional measures of standardization will be found advantageous to all concerned.

The circumstance that many steel products fall into the category of capital goods attaches a special significance to the standardization of their

¹Abstracted from an address before the National Association of Purchasing Agents' Twenty-fifth Annual International Convention, June 3-6, 1940.

²Vice-president, American Standards Association.

“... we shall not be found wanting”

“We cannot hope to maintain our position in any sort of competition without having injected into our productive enterprises the last measure of efficiency.

“That last measure may well be the subject we have been discussing.

“Standardization is not an end in itself, it is fundamentally a contributor to the efficiency of industry. By serving to eliminate nonessentials it paves the way for rapid and economical production. In the present international competition for political and commercial position, a very narrow margin of superiority may be the factor which determines the swing of the balance. We in America are incorporating the principle of standardization into our industrial efforts so that when we are weighed in the national or international balance, we shall not be found wanting.”

—R. E. Zimmerman.

properties. Large users of steel, fabricators and manufacturers, are accustomed to draw upon more than one source of supply for their materials, often for the production of the same or identical parts. This means that the performance of steel from the different sources must be substantially uniform, or in other words, it must be produced to meet definitely prescribed standards. Drawing and machining qualities, weldability, resilience, hardenability, resistance to elongation at elevated temperatures, and electromagnetic characteristics are examples of properties which must be controlled within specified limits if market participation is to be expected. The kind of standardization necessary to provide for the conditions just described affects a wide variety of steel products, such as bars, sheets, wire, and tubing in both carbon steel and alloy grades.

Standardization Made Attractive

To illustrate one of the important factors which makes a reasonable degree of standardization attractive to both producers and consumers, some recent words on the subject will be repeated or paraphrased as follows:

Diversification tends to diminish the tonnage

involved in the various items scheduled for production in the steel mill.

Needless diversification and the small order walk hand in hand. Now the steel producer is not at all unappreciative of small orders, particularly when conditions are such that they may be combined and consolidated for execution at the mill. A hundred relatively small orders, if they involve only standard products without much variety, need not present a serious problem as to melting, rolling or processing. As variety increases, however, the expense of production mounts rapidly. To roll only five tons of a certain selected shape costs \$8.80 more per ton than to roll one hundred tons; in another case the added cost amounts to \$12.95, and in a third instance the excess is more than \$15.00 per ton. Figures applying to one ton, as against one hundred, or fifty, or even five tons, are almost startling, for the additional costs alone often equal or exceed the selling prices.

A Troublesome Condition

The customer is not at fault in this matter, not in the least. It simply represents a troublesome condition which in its broader aspects can be greatly ameliorated, although not entirely cured, by an application of the principles of standardization. This presupposes a cooperative approach on the part of both consumer and producer.

It is hardly possible that standardization of products could take place without standardization of processes. That is exactly the case. The steel industry has been paying meticulous attention to its means and methods of production, all of the way from the selection of raw materials to the finishing operations on products prior to shipment. Suitable methods of chemical analysis, determination of physical properties, the setting up of rational tolerances for gauge and shape, and the development of standards for surface finish are a few of the factors which now enter, significantly, into the control of operations. Pyrometry at all important points is doing indispensable service. The application of the teachings of physical metallurgy to steel-making as well as to the heat treatment of various grades of steel is systematizing the procedures and making for regularity and reproducibility in the product. All of this has been matched by the ingenious mechanical devices with which the steel mills have been equipped, practically all of them electrified for precise operation and control.

We are not here proclaiming the dawn of the millennium in the steel business, as you may think, not even in its technical aspects. Much

remains to be done. Experience has shown that any attained position is subject to change, particularly in an era of rapid technological advancement. Standardization, we repeat, must be dynamic enough to permit of improvement and progress.

Further in the interest of rational standardization, the steel industry, through the American Iron and Steel Institute, is applying organized and conscientious efforts to the task of codifying the necessary underlying information. The Technical Committee of the Institute, in collaboration

with the Manufacturing Committee, is preparing a comprehensive manual which will (1) classify and define the products of the iron and steel industry, (2) collect and present data pertaining to manufacturing tolerances, (3) collect information relative to methods of inspection for each product, and (4) review existing specifications that might be considered appropriate as current standards in their respective classes. This is all in line with a policy of good housekeeping and should be effective in preparing the way for subsequent cooperative effort with the consumer.

British Association Continues Work On Standards for Consumer Goods

The British Retail Trading Standards Association has been continued during the war, the annual report for 1939-1940 announces. The need for maintaining a check upon misleading advertising in a period when substitution and lower qualities were likely to be prevalent, and the possibility that the Association might be of some service to the Government, were both factors which gave rise to this decision, the report declares.

The work on standards for consumer goods in Great Britain has been broadened during the past year through the efforts of the Association which has cooperated with the British Standards Institution in organizing a Distributive Industry Committee as one of the coordinating committees of the BSI. Represented on this BSI committee are the Drapers' Chamber of Trade of Great Britain and Ireland; Multiple Shops' Federation; National Chamber of Trade; National Federation of Grocers' and Provision Dealers' Association; Retail Distributors Association; Retail Trading Standards' Association.

The committee will act as an advisory committee whenever standards concerning the retail trades are being prepared by other BSI industry committees. It will also have authority to formulate standards for trade terms, sizes, measurements, etc., related to distribution of commodities.

In addition, it will have the authority to investigate the possibility of preparing standards for articles, materials, etc., required by the distributive trades and not for re-sale, and to take the necessary action in connection with such standards.

The RTSA operates a testing laboratory where tests are made on consumer goods either to check

the claims of retailers on goods offered for sale, or at the request of manufacturers who sell the goods tested under a Certified Merchandise Scheme.

BSI Tells South America About British Standards

The British Standards Institution is now working on a technical handbook in Spanish to tell prospective purchasers in South America what British industry has to offer.

A Committee of Direction under the chairmanship of Dr. T. Swinden of the United Steel Companies, Ltd., made up of a number of experts, has been set up to study the project. The committee has decided unanimously that the handbook should cover all branches of industry interested in South American trade.

List of Standards of Australian Standards Association Received

Copies of the latest List of Publications of the Standards Association of Australia has been received by the Library of the American Standards Association. The Library will be glad to lend copies of the List to ASA members. The booklet contains a classified numerical list of publications and also an index of standards arranged alphabetically according to subject.

Australian Standards Association Adopts British Steel Standards

A broad program for the standardization of steels for aircraft has just been reported by the Standards Association of Australia, which recommends the use of certain British Standards for steel and the adoption of a single material rather than a number of special materials in order to bring about simplification in production.

The steel standardization program is under the supervision of a Special Committee on Steels for Aircraft, organized by the SAA to co-ordinate the work on aircraft materials and components, and to correlate local specifications with British standard Specifications.

Wherever a study of British specifications has indicated that the requirements of the specifications could be supplied by Australian manufacturers without great difficulty, the British standards have been approved by the Standards Association of Australia as Australian Standards without change. These include:

British Standard No. 2 S.14, Carbon Case-Hardening Steel

British Standard No. 3 S.15, 3 Per Cent Nickel Case-Hardening Steel

British Standard No. 2 S.21, "20" Carbon Steel

British Standard No. 3 S.24, Bright Steel Bars for Keys

British Standard No. S70, 55 Carbon Steel (Normalized)

British Standard No. 2 S.81, 65 to 75 Ton Nickel Chromium Steel

British Standard No. S.84, Low Carbon Steel Sheets and Strips (suitable for welding)

British Standard No. S.90, High Tensile 5 per cent, Nickel Case-Hardening Steel

British Air Ministry Standard DTD 299, Mild Steel Bars, Forgings and Tubes (suitable for bearings and shells)

British Air Ministry Standard DTD 331, 80-90 ton Nickel Chromium Steel

In cases where the materials specified are not at present manufactured locally but could be manufactured if the demand were great enough, the British specifications have also been endorsed as Australian Standards without change. These standards are:

British Standard No. 2 S.28, Air-Hardening Nickel Chrome Steel

British Standard No. S.65, 65 Ton Nickel Chrome Steel

British Air Ministry Standard DTD 5A, Hard-drawn Carbon Steel for Valve Springs

British Air Ministry Standard DTD 49B, High Nickel High Chromium Steel Valve Forgings

British Air Ministry Standard DTD 215, High Tensile Steel Wire

In some cases the British specifications called for in aircraft to be produced or used in Australia cannot be met by locally produced materials, but other British specifications, designed for similar applications, are available and can be met by Australian steels. The following specifications have been approved as Australian standards on this basis to be used instead of British Standard 2 S.76 and Air Ministry Specification DTD 311:

British Standard No. S.69, 3½ per cent Nickel Steel
British Air Ministry Standard DTD 13B, Silicon Chrome Valve Steel

In addition to these British standards, the Standards Association of Australia is preparing an Australian standard for 40-ton carbon steel suitable for welding, to be used whenever the British Standard for Bright Steel Bars, No. 3 S.1, for "40" Carbon Steel (Normalized) No. 3 S.6, and British Air Ministry Standard DTD 126A, "40" steel suitable for welding are called for.

Standard Plant Names Urged To Make Trade Easier

The standardization of plant names and plant products was advocated in a report of the committee on nomenclature at the closing session of the sixty-fifth annual convention of the American Association of Nurserymen in the Hotel Pennsylvania, New York, July 26.

Standardization is needed, according to the report, to facilitate the exchange of plants and plant products in trade, to record single botanical names and common names for all plants and plant products and to establish the principle "that a common plant name once adopted shall not again be used as a name for any other plant in its same group or class."

"It is encouraging to note," the report said, "that in the case of scientific names, the use of homonyms has been definitely outlawed by the International Botanical Congress."

"Much of the confusion in plant identity today," it adds, "is directly traceable to this unscientific and inexcusable procedure of the past which is choking botanical and horticultural literature with an increasingly hopeless jumble of Latin names of doubtful import. Horticulturists share equally with botanists the onus for this practice."

British Standards Institution Changes Methods to Speed Work

"The machinery of the British Standards Institution has been adapted to enable War Emergency Revisions or the preparation of War Emergency Standards to be put through with a minimum of delay—in some cases merely a matter of a few days. The War Emergency Standards (or Revisions) are being issued in a distinctive form (on yellow paper) so as to avoid confusion with the general BS standards and it is also being made clear, wherever necessary, that such standards or revisions only apply to the home market and not to the export trade and can be modified again when peace comes.

"A number of such war revisions bringing about the necessary coordination have already been issued and others are being prepared.

"We might also add that in this work we are receiving the full cooperation of the appropriate Government Departments who are frequently the users most directly concerned and they welcome the issue of these War Emergency Standards where such are found necessary."

—C. le Maistre, Director, British Standards Institution

This quotation is a part of a letter sent by Mr. le Maistre to editors of trade and technical publications in Great Britain asking trade organizations to use the BSI war emergency procedure for modification of British Standard specifications rather than making unauthorized changes in the standards.

Standards under Discussion for Wrapping and Packing Supplies

Revisions of existing Simplified Practice Recommendations for sizes of corrugated, folding, and set-up boxes, and of notion and millinery paper bags used by department and specialty stores have been formulated, and copies sent to those concerned for approval, according to an announcement by the Division of Simplified Practice, National Bureau of Standards.

A new Simplified Practice Recommendation which covers single-faced corrugated-paper rolls has been set up and copies of this proposed recom-

mendation have also been circulated to those concerned for their approval.

A comprehensive survey of current practice in department and specialty stores was conducted cooperatively by a Committee on Simplification and Standardization of Wrapping and Packing Supplies of the National Retail Dry Goods Association, and the Division of Simplified Practice. The facts disclosed in the survey were used as a basis for the changes in the recommendations which are being revised and for the new recommendation for single-faced corrugated-paper rolls.

The Division of Simplified Practice, in its announcement also states, "As shown in a 'Wrapping Supply Manual,' published by the Store Management Group of the National Retail Dry Goods Association, the proponents are confident that these simplification programs hold potential benefits and savings for the stores, which spend an aggregate of \$25,000,000 a year on wrapping supplies. Adoption of the recommendations should also prove advantageous to the manufacturers of these supplies."

Mimeographed copies of the proposed recommendations may be obtained free upon request from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C.

New Method for Measuring Water Absorption of Plastics

A new method of measuring the absorption of water by plastics has been prepared by a subcommittee of the American Society for Testing Materials' Committee on Plastics, working in cooperation with two subcommittees of the ASTM Committee on Electrical Insulating Materials. This method has been adopted by the ASTM as a Tentative Standard and replaces the short-time water absorption tests provided in ASTM Standard D48-39 for molded insulating materials, D229-39 for sheet and plate materials, D349-39 for laminated round rods, and D348-39 for laminated tubes, according to the September issue of the *Technical News Bulletin*, published by the National Bureau of Standards.

Recommendation Reaffirmed For Abrasive Grain Sizes

The standing committee in charge of the Simplified Practice Recommendation R118-36, covering Abrasive Grain Sizes, has completed a review of the recommendation and has unanimously

reaffirmed the table of grain sizes which constitutes the recommendation, the Division of Simplified Practice of the National Bureau of Standards announces.

Recently, the National Bureau of Standards and the American Society for Testing Materials adopted a new table in which there are revisions of the permissible variations in both maximum openings and of the limits for wire diameter in the screen cloth of standard sieves. This table supersedes a similar table which was published in R118-36 to give reference data on sieves for measuring grain sizes. The new table is a part of the ASTM Standard Specifications for Sieves for Testing

Purposes (ASTM E11-39), which has been approved by the American Standards Association as an American Standard, with the ASA symbol Z23.1-1939. The standing committee in charge of Simplified Practice Recommendation for Abrasive Grain Sizes has recommended that the new table on sieves replace the old for reference in using the recommendation for abrasive grain sizes.

Mimeographed copies of the recommendation including the new table may be obtained from the Division of Simplified Practice, National Bureau of Standards, Washington, D. C., free of charge.

ASA Standards Activities

Approved Standards Available Since Publication of Our August Issue

- National Electrical Code (Revision of C1-1937)
American Standard C1-1940 5¢
- Rules for Rounding Off Numerical Values American
Standard Z25.1-1940 20¢
- Specifications for Rubber-Insulated Tree Wire (Revision of C8.16-1936) American Standard
C8.16-1940 20¢
- Backlash for General Purpose Spur Gearing
American Standard B6.3-1940 25¢

Standards Now Being Considered by Standards Council for ASA Approval

- Keyways for Holes in Gears B6.4
- Standards for Felt

Proposed American Recommended Practice for the Use of Explosives in Anthracite Mines M27

Commercial Standards for Sun Glass Lenses
(CS 78-39; CS 79-39)

Methods of Testing and Tolerances for Tubular Sleeving and Braids (ASTM D 354-36) L13

Protection of Structures Containing Inflammable Liquids and Gases—Part 3 of Code for Protection Against Lightning (From status as American Tentative Standard to American Standard) C5, Part 3

Electric Fences, Part 6 of the National Electrical Safety Code

Cast-Iron Pipe Flanges and Flanged Fittings, Class 250 (Revision of B16b-1928)

Drafts Available

- Soldered-Joint Fittings for Plumbing Equipment A40
- Air Gaps in Plumbing Fixtures A40

American Standard

Rules for Rounding Off Numerical Values

(Z25.1-1940)

20¢ per copy

Order now from the:

American Standards Association

29 West 39th St.

New York, N. Y.

1940 NATIONAL ELECTRICAL CODE

For "the practical safeguarding of persons and of buildings and their contents from electrical hazards arising from the use of electricity for light, heat, power, radio, signalling and for other purposes"



Order Your Copy Now

American Standards Association

29 West 39th Street, New York, N. Y. Date _____

Gentlemen:

Please send me a copy of the NATIONAL ELECTRICAL CODE (C1-1940), for which I enclose 5 cents.

Name _____

Street _____

City & State _____



In
S
an

Oct